Attachment B
IRA Work Plans: Tittabawassee River Floodplain Soils

Tittabawassee River and Floodplain Interim Response Activities Work Plan

Prepared for

The Dow Chemical Company

Midland, Michigan

February 2004

CH2MHILL

Contents

Acronyms and Abbreviations

ATSDR	Agency for Toxic Substance Registry
Dow	The Dow Chemical Company
FEMA	Federal Emergency Management Agency
IRA	Interim Response Activity
License	Dow's Part 111 Hazardous Waste Facility Operating License
MDEQ	Michigan Department of Environmental Quality
PCOI	Potential Constituent of Interest
ppt	parts per trillion
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedures
TEQ	2378 TCDD Toxic Equivalent

Tittabawassee River and Floodplain Interim Response Activities Work Plan

1. Introduction

This document describes the overall scope and process Dow will use to perform Interim Response Activities (IRAs) for the Tittabawassee River and Floodplain. The IRAs are being performed pursuant to Condition XI.B.3.(a) of the Hazardous Waste Facility Operating License (the License) issued to Dow on June 12, 2003, by the Michigan Department of Environmental Quality (MDEQ).

1.1 Overall IRA Objectives

IRAs are short-term actions that are taken to control ongoing risk while site characterization is underway or before a final remedy is selected. The primary objectives of these IRAs, therefore, are to identify and, as necessary, mitigate the potential for people to be exposed to dioxins and furans that may be found in soils during this interim period prior to completion of the Remedial Investigation (RI). More specifically, these IRAs will:

- Identify residential and agricultural properties abutting the River and prioritize such property for sampling.
- Evaluate the potential for property located within the Federal Emergency Management Agency (FEMA) estimated 100-year floodplain to have elevated concentrations of chemicals of concern based on the location and setting of the property relative to the River.
- Establish, and propose for MDEQ review and approval, the process by which the need for and range of interim actions will be determined. This process will consider the potential for human exposure, based on land use, as well as existing data and IRA sampling results.
- Identify a range of interim actions that can be implemented immediately, as appropriate, given site-specific conditions and with consideration to property owner requests.
- Obtain information that can be used for development of site-specific cleanup criteria, as well as the planning of future soil and sediment sampling activities to be conducted under the Remedial Investigation Work Plan (RIWP).

These IRAs will evaluate properties along the Tittabawassee River from the upstream boundary of the Dow Midland Facility to the confluence with the Shiawassee River in Saginaw County, per Condition XI.B.3 of the License, as shown in Figure 1. The IRAs focus on properties that are both within the 100-year floodplain and that touch the river as currently estimated by FEMA.

Information presented herein includes:

- A description of each IRA, as well as a brief discussion of where it contributes or fits into the proposed Prioritization for Interim Actions
- The Interim Action Decision Matrix that will be used to identify the need for and range of interim actions Dow will offer to property. This process incorporates the concepts discussed with MDEQ in meetings during early 2004.
- A list of contacts for the IRA work.
- Detailed work plans for the following IRAs have been developed as stand-alone documents and are included as Attachment.

2. IRA Components and Prioritization for Interim Actions

In order to determine what interim actions may be appropriate to reduce the potential risks associated with dioxin-contaminated soils to residents along the Tittabawassee River, the following questions need to be answered:

1. What properties are located along the river? Which properties are residential and which are agricultural, and what portion of those properties is within the floodplain?
2. What are the physical characteristics of the property? Is it wooded? Is there grass or other vegetative ground cover present?
3. Who occupies or frequents the property, how do they use it, and what portions of the property are actively used?
4. Are dioxins and furans present in surface soils at concentrations greater than MDEQ's Generic Residential Cleanup Criteria of 90 parts per trillion (ppt)?

As these questions are answered, appropriate interim actions will be offered to property owners, which may include:

- Educational materials will be sent to all owners of property abutting the Tittabawassee River
- Interior house cleaning
- Physical identification of potentially contaminated areas
- Placement of interim cover materials

The following sections outline Dow's proposal for identifying appropriate interim mitigation actions. Section 2.1 describes the individual IRAs and how they will answer the questions outlined above. Section 2.2 describes how the Prioritization for Interim Actions uses information from the initial IRAs to more specifically determine which interim actions are appropriate, and defines the proposed actions in more detail.

2.1 IRA Descriptions and Sequence

2.1.1 Exposure Pathway Mitigation at Riverside Boulevard Site

The objective of the Riverside Boulevard IRA is to identify and evaluate the potential for residents to be exposed to dioxins and furans, and to offer, as appropriate based on the data, interim mitigation actions. This IRA has been initiated based on existing MDEQ data and will be implemented immediately upon MDEQ approval of the Work Plan. MDEQ has

required Dow to offer a range of actions immediately to begin reducing residents potential for exposure, as noted in Comment 27 of the December 12, 2003, Notice of Deficiency on the Remedial Scopes of Work for Midland Area Soils and the Tittabawassee River and Floodplain.

The first step of this IRA is to complete a survey, requesting information from residents that will be used to identify potential exposure pathways, followed by a step-wise process to evaluate exposure pathways. Then, as appropriate, based on the data and evaluation, actions will be offered to reduce the potential for exposure.

The Riverside Boulevard IRA incorporates the processes described in Section 2.1.4 and 2.1.5 , and will use the Prioritization for Interim Actions and Matrix described in Section 2.2 to identify the mitigation measures that will be offered to property owners.

Further details regarding the scope and schedule of this IRA are described in the IRA Work Plan: Exposure Pathway Mitigation at Riverside Boulevard Site, presented in Attachment A.

2.1.2 Mapping

The primary objective of this IRA component is a preliminary identification of all residential properties and agricultural properties that abut the Tittabawassee River. A secondary objective is to obtain and compile existing mapping data, such as previous sample locations, topography, property ownership information, etc., for use in IRA and RI planning.

Work on the Mapping IRA component has been underway since December, 2003. Dow has obtained information regarding property ownership, current zoning designations, FEMA's estimated floodplain boundaries, and aerial photographs, and this information has been incorporated into the Geographic Information System (GIS) database. MDEQ sampling data and updated topographic information have also been added to the GIS database.

Once the necessary information has been obtained, FEMA's estimated floodplain boundaries will be superimposed on property and zoning maps. This will result in:

- Preliminary identification of all properties that abut the River
- Preliminary information regarding how much of the property is located within the estimated 100 year floodplain and the proximity of active or developed areas. Aerial photographs will be used to make an initial assessment of developed versus undeveloped areas based on the presence or absence of buildings, woods, cleared areas, etc.
- Preliminary identification of the current land use, based on zoning, property ownership, and review of aerial photographs

This information will be used to identify residential and agricultural properties which will be further evaluated in the next IRA component, "Identification of Interim Action Properties." Further details regarding the scope and schedule of the Mapping IRA component are described in the detailed work plan provided in Attachment B.

2.1.3 Identification of Interim Action Properties

The objective of this IRA is to identify residential and agricultural properties that are candidates for sampling as part of this IRA.

This IRA will build on and refine the Mapping IRA results. Information developed in the Mapping IRA will be field verified through visual ("windshield") surveys, observing properties

from either public roads or the river. This will include field verification of information obtained from aerial photographs, such as the presence and type of buildings, evidence of occupancy and type of land use, and the proximity of actively used areas to the river. Additional details regarding physical site conditions (particularly conditions that would affect the amount of contact a person could have with exposed soils) such as riverbank structure and the presence of vegetation and ground cover will also be obtained.

If the resulting information indicates that a certain property is undeveloped or currently inactive, the property will be assigned lower priority for inclusion on the list of Interim Action Properties (although information on that property will be retained for future use, if necessary). Properties found to:

1. abut the river,
2. have areas at elevations that are likely to be regularly flooded, and
3. have active residential or agricultural use within these regularly flooded areas

will be considered high priority candidates for inclusion on the list of "Interim Action Properties."

Further details regarding the scope and schedule of the Identification of Interim Action Areas IRA are described in the detailed work plan provided in Attachment C.

2.1.4 Property Owner Notifications and Activity Surveys

The objective of this IRA is to initiate contact with the owners of the Interim Action Properties, provide them with appropriate information, and request their participation in the Interim Response Action process.

The first step in this IRA is to send a mailing to these property owners and/or occupants. The mailing will start with a cover letter containing a description of the overall IRA process, a summary of results to date, and the purpose of the mailing. Copies of potentially appropriate and applicable educational materials developed as part of the Community Information IRA will be provided as part of the mailing. An "Activity Survey" will request basic information about the people who use the property (such as age, frequency of use, etc.), how they use the property (gardening, recreation, outdoor eating, etc.), and the location of the various activities. Finally, a draft Access Agreement will be included requesting permission for Dow representatives to enter the property to observe site conditions and perform sampling.

In the cover letter, Dow will request that the property owner and/or occupants contact Dow to confirm receipt of the materials and indicate their willingness to participate in the IRA. To the extent Dow is able to obtain telephone numbers for individual property owners, Dow will also attempt to follow the mailing with a telephone call. Dow will copy MDEQ on these initial mailings, so the Agency has a record of contact.

Additional IRA activities will be determined based on the owner/occupant's response to this Notification and Activity Survey. If the owner/occupant elects not to participate, Dow will not be able to identify the need for or offer specific interim actions. If the owner/occupant elects to participate:

- Dow will meet with the owner to review the response to the Activity Survey, walk the property to observe the condition and physical characteristics, and develop an understanding of how the property is being used. This information will be combined with sampling data, as discussed below, to determine which Exposure Category is

appropriate for the property. Each Exposure Category corresponds to a range of interim actions that will be discussed with the property owner, as described in Section 2.2.

- During this meeting, Dow will discuss what type of sampling may be appropriate for the property. Dow and the property owner will identify sample locations and finalize necessary access agreements.
- Dow will provide the owners with a letter that summarizes the meeting and will provide information on future activities (such as a general schedule for sampling and other information as requested).
- If the results of the Activity Survey and meeting indicate that the property does not meet any of the criteria associated with implementation of an interim action (as shown in Section 2.2), Dow will send the owner a letter indicating that no actions will be taken at this time.

Further details regarding the scope and schedule of the Property Owner Notification and Activity Survey IRA are described in the detailed work plan provided in Attachment D.

2.1.5 Sampling and Analysis Data

In order to determine whether further IRA activities are necessary, data regarding the concentration of dioxins and furans in soils will be needed. First, information from all of the IRAs completed to date will be reviewed to establish the appropriate "sampling area". The sampling area will be established to determine whether sampling and analytical data taken at certain points could be considered reasonably representative of conditions within the area. The sampling area may be a single parcel or a group of properties if the group were found to be similar in elevation, topography, physical characteristics, and proximity to the river.

Once this determination is made, existing MDEQ data will be reviewed to see whether they provide sufficient information on the sampling area. If the existing data are found to be adequate, an Exposure Category will be determined and the Interim Action Decision Matrix shown in Table 1 will be used to identify the appropriate interim action. If the existing data are not considered adequate, Dow will develop and implement a SAP to obtain more data about the area.

2.1.5.1 Sampling and Analytical Plans

One of the primary objectives for the IRA sampling plans is to determine whether dioxins and furans are present in surface soils at concentrations greater than the IRA Action Levels described in Section 2.2. Because IRA data will be used for future RI work, IRA plans will be developed on the same basis as subsequent RI sampling plans to ensure that data are consistent, of the same quality and can all be considered as part of the RI evaluation. An additional objective of the IRA sampling plans, therefore, will be to obtain information that can be used to establish site-specific cleanup criteria and develop the scope of the RI. This could include analysis for other Potential Constituents of Interest (PCOIs), physical properties of soils, better delineation of floodplain boundaries on properties, evidence of past sediment deposition, and other information that will be incorporated into the RI. These will be described in the Site-Specific SAP.

Core Program Plans and Standard Operating Procedures (SOPs) are currently being developed by Dow and will be used for all sampling performed as part of the Offsite Corrective Action Work. Core Program Plans such as the Health and Safety Plan and the

Quality Assurance Project Plan (QAPP) will be incorporated into the IRA plans by reference, as will applicable SOPs to describe specific methodologies and protocols for sampling and analytical work. These documents will be provided to MDEQ for review prior to submittal of the site-specific sampling and analytical plans.

Site-Specific SAPs will be prepared to reflect the overall RI objectives and strategies. These SAPs will provide the site-specific details associated with field sampling efforts, and will include:

- Sampling event objective
- DQO(s)
- Description of sampling effort
- Sampling locations (figure with locations shown on a GIS aerial photo base map)
- Sample details (a matrix indicating media, sampling interval, and analytes)
- Analyte lists which may include the PCOIs identified to date as part of the development of the Current Conditions Report

Sampling and analytical plans will be provided as future submittals to MDEQ for review and approval.

2.1.5.2 Field Sampling and Analytical Work

As MDEQ is reviewing the IRA Sampling Plans, Dow will be assembling field crews, obtaining utility clearances and any permits associated with the proposed field work. Dow will initiate field sampling activities upon MDEQ approval of the IRA Sampling Plans, and will provide both MDEQ and the property owner with 5 working days prior to the sampling date.

2.1.5.3 Data Evaluation and Reporting

Once sampling and analysis have been completed for an IRA, the following tasks will be performed:

- Perform data validation to ensure appropriate quality assurance and quality control (QA/QC) and to check that DQOs were met.
- Evaluate data according to the Prioritization for Interim Actions outlined in Section 2.2 below and identify the corresponding range of Mitigation Options as outlined in The Interim Action Decision Matrix in Table 1.
- Update the Conceptual Site Model to refine the understanding of physical site conditions, nature and extent of contamination, potential exposure pathways, fate and transport information, and potential receptors.
- Prepare a summary report, in the form of a Technical Memorandum to document the results. Copies of these Technical Memorandums will be provided to the property owners and MDEQ.

2.2 Prioritization for Interim Actions and Interim Action Decision Matrix

The Prioritization for Interim Actions (shown in Figure 2) illustrates the general sequence of IRA activities described above. The Process also shows how decisions will be made to either move forward with additional IRAs or to reduce the priority associated with a given property and complete further actions, as necessary, during the RI. Proposed Interim Action Levels

Dow is proposing the following Interim Action Levels be used to establish Exposure Categories and in the prioritization of interim actions being conducted to reduce exposure potential during the RI and before the final remedy evaluation is completed (the numbers refer to concentrations of dioxin in soil, expressed as TEQ):

- **At or below 90 ppt – No action is required.** This is consistent with the requirements of Part 201, which indicate that no corrective action is necessary if concentrations are found to be below the applicable Generic Residential Cleanup Criteria.
- **Above 1,000 ppt – Implement actions to reduce potential exposure.** In 2001, the Michigan Department of Community Health and the Agency for Toxic Substance Registry (ATSDR) performed a public health assessment in Midland to evaluate concerns that had been expressed related to dioxins in soils. In that study, titled "Petitioned Health Consultation: Dioxin Contamination in Soil in Midland, Michigan", ATSDR stated that *"…The action level of 1,000 ppt TEQ is a concentration of dioxin in soil at which various actions may be considered to prevent or limit exposure."* ATSDR cited potential actions such as surveillance, research, health studies, community education, and exposure investigations. This level is the same as the final dioxin cleanup criteria that have been approved in several states for residential properties and is the criteria frequently.
- **Between 91 and 1,000 ppt – Provide information to reduce potential exposures.** These actions will provide property owners with information that allow them to take appropriate actions to further reduce their potential for exposure while RI evaluations are being completed.

2.2.1 Interim Action Decision Matrix

The Interim Action Decision Matrix shown in Table 1 provides a description of five proposed Exposure Categories and a range of Mitigation Options. Dow will use the information obtained through the Activity Surveys and sampling data to determine what category is appropriate for a given property, and offer the corresponding range of mitigation options to the property owner.

TABLE 1
Interim Action Decision Matrix
The Dow Chemical Company

Exposure Category	Exposure Category Description	Mitigation Options
A	Residential Use, with high potential for routine or prolonged direct contact with surface soils, dioxin and furan concentrations in surface soil (0 to 3 inches) above 1,000 ppt TEQ. Situations considered to have a high potential for direct contact with soils include areas that are frequently used for gardening or active play areas, large areas of exposed soil with no vegetation in close proximity to the residence, or other areas where the use involves routine disturbance of soils.	• Cover (sod, soil, raised garden bed, raised area, mulch) • Identify affected areas • Augment existing cover • House cleaning • Provide additional information and educational materials as appropriate

TABLE 1
Interim Action Decision Matrix
The Dow Chemical Company

Exposure Category	Exposure Category Description	Mitigation Options
B	Residential Use, with lower potential for routine or prolonged direct contact with soils, dioxin and furan concentrations in surface soil (0 to 3 inches) above 1000 ppt TEQ. Situations considered to have lower potential for direct contact with surface soils would include areas with occasional use, areas covered by wood decking or with significant vegetative cover.	• Identify affected areas • Provide additional information and educational materials as appropriate
C	Residential Use, with minimal potential for direct contact with surface soils, dioxin and furan concentrations in surface soil (0 to 3 inches) less than 1000 ppt TEQ.	• Identify affected areas • Provide additional information and educational materials as appropriate
D	Agricultural Use, that is actively farmed	• Identify affected areas • Provide additional information and educational materials as appropriate
E	Recreational Use (if not addressed in a separate IRA).	• Provide additional information and educational materials as appropriate
F	Other uses not covered in Items A-E which exceeds applicable generic criteria.	• Provide additional information and educational materials as appropriate

The mitigation options cited in Table 1 above are currently defined as follows:

- House cleaning would be performed for residential properties where surface soils were found to have dioxins and furans at concentrations greater than 1000 ppt TEQ in areas immediately adjacent to the house. Cleaning would focus on the interior of the house and would include cleaning of surfaces and replacing furnace filters. Interior surfaces will be sampled before and after cleaning to document conditions.
- Mitigation activities involving a cover could include placing clean topsoil and or sod, and relocating or raising garden beds.
- The approximate area where sampling results indicate that dioxin and furans may be present will be identified. Identification may be made using flags, stakes or other practical methods, based on Dow's discussions with the individual owners/occupants.

3. Contacts

The following individuals will be available to provide information on IRA activities throughout the process.

3.1 Dow

Ben Baker – Senior Environmental Project Leader
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3.2 CH2M HILL

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Chris Greer – Mapping Coordinator
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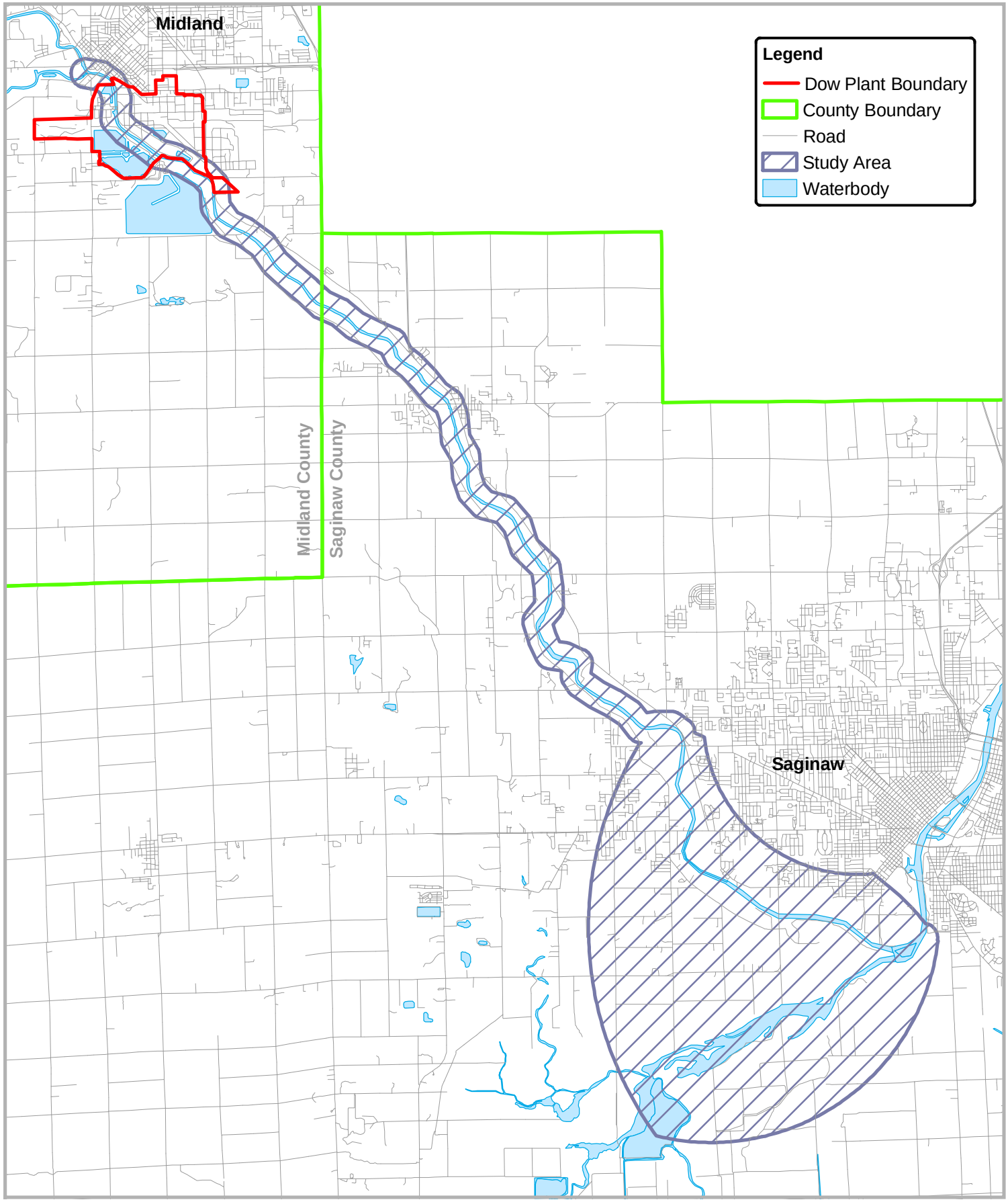

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Figure 1
Site Location
Tittabawassee River IRA
Dow Midland Offsite Corrective Action Program

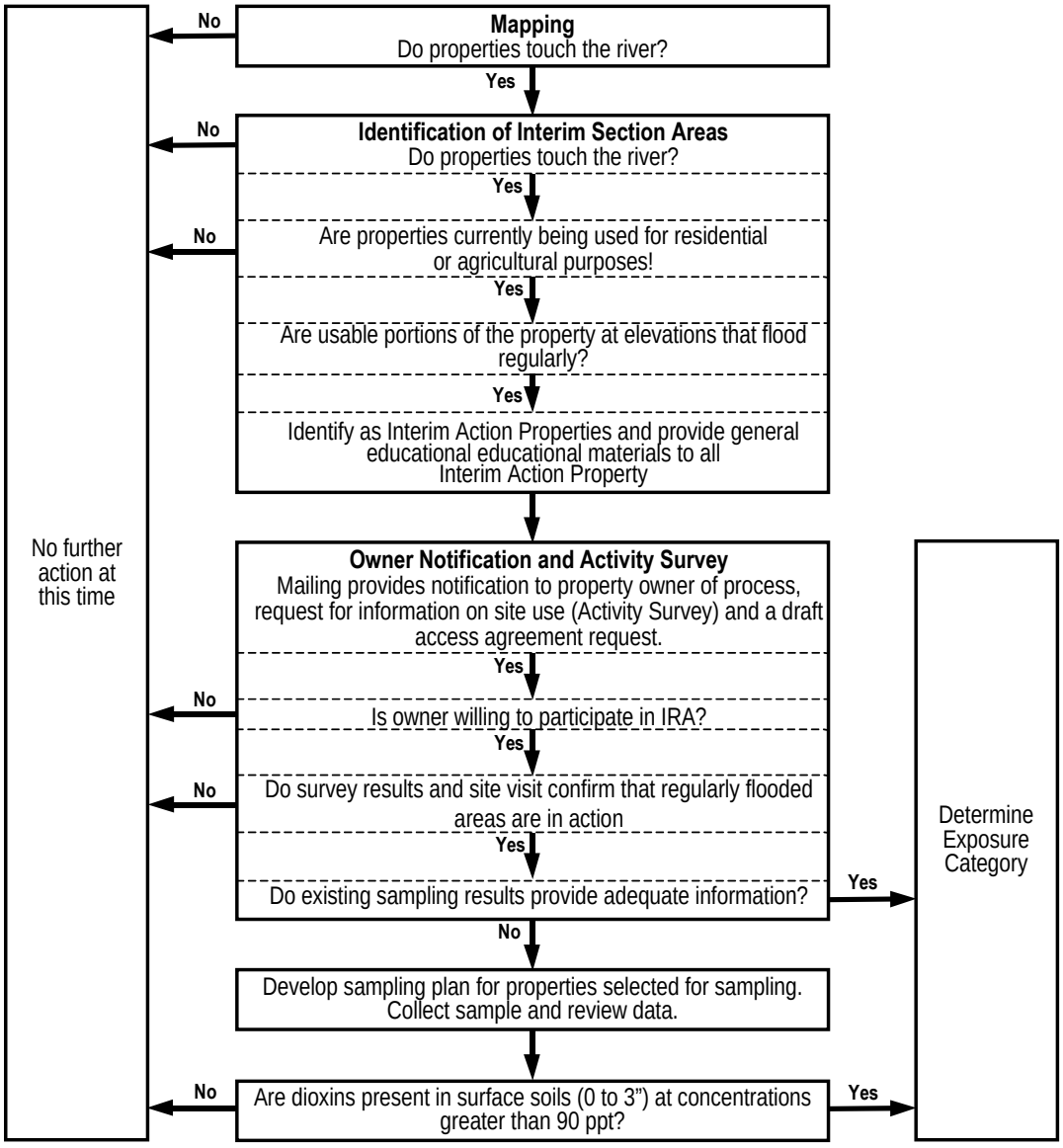

Figure 2: Interim Action Decision Process

Appendix A
Tittabawassee River and Floodplain IRA: Work Plan for Exposure Pathway Mitigation at Riverside Boulevard Site

Tittabawassee River and Floodplain IRA: Work Plan for Exposure Pathway Mitigation at Riverside Boulevard Site

Prepared for

The Dow Chemical Company

Midland, Michigan

February 2004

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Abbreviations and Acronyms

IRA	Interim Response Activity
MDEQ	Michigan Department of Environmental Quality
Site	Riverside Boulevard
SOP	Standard Operating Procedure

Tittabawassee River and Floodplain IRA: Work Plan for Exposure Pathway Mitigation at Riverside Boulevard Site

1. Introduction

This work plan describes an Interim Response Activity (IRA) for residents who reside along Riverside Boulevard ("Site") (See Figure 1). This IRA is being implemented pursuant to Condition XI.B.3.(a) of the Hazardous Waste Facility Operating License issued to Dow on June 12, 2003, by the Michigan Department of Environmental Quality (MDEQ) as well as Comment #27 in the December 12, 2003, Notice of Deficiency. This work plan presents the following information:

- Objectives of the IRA
- Description of the approach to the IRA
- Identification of access needs and agreements for the Riverside Blvd. residences
- Contacts
- Standard Operating Procedures (SOPs) for implementation of the IRA

2. Interim Response Activity Objectives

The IRA is being conducted to reduce the potential for exposure to dioxins and furans in soil. Adequate sampling has not been conducted to evaluate the presence or the absence of potential exposure pathways at the residences.

3. Description of the Interim Response Activity

The overall approach to the IRA involves a survey of the residents to identify potential exposure pathways, followed by a step-wise process to evaluate exposure pathways indoors and outdoors and, as appropriate, and based on the data, reduce the potential for exposure. The MDEQ will be notified in advance of any steps or activities associated with the implementation of this IRA work plan. The IRA will consist of the following steps:

- Initiate contact with the residents and request cooperation for implementing IRA activities.

- Conduct a survey of each residence for activities that could bring residents into contact with potentially affected soil or sediments. The locations of sampling will be based on an evaluation of the participating resident's property and the information provided in response to an Activity Survey. Samples will be collected from locations that present the highest potential for human exposure and will be analyzed for dioxins and furans. Sampling decisions will also include an evaluation of the location to determine whether samples are representative of the area over time.

- In advance of any further investigation, based on the limited sampling previously conducted by MDEQ, residents will be offered indoor house cleaning identified in the

Interim Action Decision Matrix presented in Section 2.2.1 of the Tittabawassee River and Floodplain Interim Response Activities.

- Based on the survey results and subsequent sampling and analysis, an assessment will be made regarding further response activities to mitigate, as appropriate, exposure pathways that may exist at each residence. Based on the data and use information obtained from the implementation of sampling and the responses to the property and residence questionnaires, as appropriate, Dow will offer the following potential interim response actions as set forth in the Interim Action Decision Matrix.

  Completion of any interim response activities at each residence will be documented.

4. Site Activities

Cooperation of the residents will be required to implement the interim response activities described in the previous section. The process for obtaining cooperation will involve the following steps:

- Distribution of notification materials to each residence seven to 14 days prior to conducting a visit. The notification materials will consist of an introductory letter from Dow, a tentative schedule and approximate time and date when the residents may expect a phone call to discuss access and solicit their cooperation with the proposed assessment.
- After the notification package has been mailed to the homes, residents will be contacted by telephone to schedule an initial visit
- During this initial visit, field staff will obtain a signed access agreement from the resident, and will complete the residence survey form. During that initial site visit, the field staff will evaluate potential areas for sampling, weather permitting. A follow-up visit may be needed if weather conditions do not allow for adequate visual evaluation of property.
- Field staff will follow up to confirm a date for house cleaning and for a second visit to perform sampling to determine if elevated levels of dioxins and furans are present.
- After receipt of all analytical data, residents will be contacted to schedule a meeting to discuss the dust and soil results and, as appropriate, mitigation activities related to the results.
- Following discussion of the analytical data and range of alternatives, a schedule for the implementation of any mitigation activities will be agreed upon between the resident and Dow.
- The resident(s) will be contacted by telephone at least 2 days prior to any scheduled visit to confirm the date and time.
- MDEQ will be notified in advance of all steps and activities involved in this protocol.

Sample notification materials and a sample access agreement are provided as attachments to the IRA Work Plan: Property Owner Notification and Activity Survey.

5. Interim Response Activity Plan Figure

Sketch maps of each residence identifying key features and locations where sampling and/or response activities may be or have been conducted will be prepared as part of each completion report.

6. Sampling and Analysis Plan

Data to be collected as part of this IRA include the residence survey form, analytical data, and photographs of outdoor site conditions prior to and following response activities. Completion reports will be developed for each residence, documenting the survey results, analytical data, and mitigation activities completed.

7. Schedule

The IRA schedule is as shown in the SOW Schedule in Attachment G of the Revised Scope of Work, Tittabawassee River Sediments and Floodplain.

8. Contacts

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9. References

Michigan Department of Environmental Quality (MDEQ). 2003. *Final Report: Phase II Tittabawassee/Saginaw River Dioxin Floodplain Sampling Study.* August 2003.

10. Attachments (to be developed)

- Sample Access Agreement

- Sample Notification Materials
  - Introductory Letter
- Standard Operating Procedures
  - Residence Survey Form (This is an example that could be adapted for this IRA).
  - Soil/Sediment Sampling Procedure[(1)]

[(1)]These procedures are part of the Core Program Plans and will be submitted as part of the RI work plan.

Source Information:
Base mapping from State of Michigan Center for Geographic Information, Geographic Data Library.

Figure A-1
Riverside Boulevard IRA Area
Tittabawassee River Floodplain Interim Response Activities
Dow Midland Offsite Corrective Action Program

Appendix B
Tittabawassee River and Floodplain IRA: Work Plan for Mapping

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Prepared for

The Dow Chemical Company

Midland, Michigan

February 2004

CH2MHILL

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Acronyms and Abbreviations

BFE	base flood elevations
DDS	Digital Data Services
DTM	digital terrain model
EDR	Environmental Data Resources
FEMA	Federal Emergency Management Agency
FIRMs	FEMA Flood Insurance Rate Maps
GIS	Geographic Information System
GPS	Global Positioning System
INS	Inertial Navigation System
IRA	Interim Response Activity
LiDAR	Light Detection and Ranging
License	Dow's Part 111 Hazardous Waste Facility Operating License
MDEQ	Michigan Department of Environmental Quality
MI CGI	State of Michigan, Department of Information Technology, Center for Geographic Information
MSU	Michigan State University
Plant	Dow Michigan Operations – Midland
SOP	Standard Operating Procedures
SSURGO	Soil Survey Geographic Database for Michigan
STATSGO	State Soil Geographic Database for Michigan
USDA	United States Department of Agriculture
USGS	U.S. Geological Survey

Tittabawassee River and Floodplain IRA: Work Plan for Mapping

1. Introduction

This work plan describes an Interim Response Activity (IRA) to provide information on mapping activities for the Tittabawassee River and Floodplain. This IRA is being completed pursuant to Condition XI.B.3.(a) of the Hazardous Waste Facility Operating License (the License) issued to The Dow Chemical Company on June 12, 2003, by the Michigan Department of Environmental Quality (MDEQ). This work plan was prepared in accordance with Administrative Rule 299.5526 for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Part 201). This IRA is also responsive to Comment Number 35 requiring mapping of the Tittabawassee River and Floodplain contained in the Notice of Deficiency issued to The Dow Chemical Company on December 12, 2003.

This work plan presents the following information:

- The objectives of the IRA
- A description of the approach to the IRA
- A description of the IRA area
- Identification of access needs and agreements
- Scope of work to be completed
- Contacts

Standard Operating Procedures (SOPs) for implementation of the IRA are being developed and will be provided to MDEQ for review by April 1, 2004.

This area has been identified for an IRA based on the results of prior environmental sampling data collected by MDEQ. The area for mapping includes lands within the 100-year floodplain, as estimated by the Federal Emergency Management Agency (FEMA), along the Tittabawassee River, commencing at the upstream boundary of The Dow Chemical Company Midland Facility and continuing to the confluence with the Shiawassee River in Saginaw County. The mapping area includes properties which are in the estimated 100 year floodplain due to flooding of the Shiawassee River. The location of the site is depicted in Figure B-1.

2. IRA Objectives

The primary objective of this IRA is to complete basic mapping of the Tittabawassee River and Floodplain for the following purposes:

- Allow further evaluation of potentially impacted properties, including identification of “frequently flooded” residential properties and agricultural properties within the floodplain
- Provide information necessary for development of the RI Work Plan

- Provide information necessary for evaluating the need for and, if necessary, planning, other IRAs
- Provide information for planning of future soil and sediment sampling activities
- Provide information to be used in the evaluation of potential corrective measures

3. Description of the IRA

The IRA will consist of the following mapping activities.

- Setting up a Geographic Information System (GIS) utilizing ESRI™ ArcMap™
- Importing geographic features into the GIS obtained from public sources, including:
  - The State of Michigan, Department of Information Technology, Center for Geographic Information, Geographic Data Library, including roads, political boundaries, surface water features, and aerial photographs from 1998
  - FEMA floodplain map for the Tittabawassee River in the study area
  - Soil types from the State Soil Geographic (STATSGO) Database for Michigan and the Soil Survey Geographic (SSURGO) Database by County for Midland and Saginaw Counties
  - Local zoning designations for the study area as obtained from local townships and cities
  - Property boundaries for parcels in the floodplain in the study area as provided by local counties and cities in the study area
  - Locations of soil and sediment samples collected by MDEQ
  - Historic aerial photographs obtained from Michigan State University for the years 1937 (Saginaw County) and 1938 (Midland County), the earliest years for which aerial coverage is available for the study area.
- Preparing or developing preliminary floodplain maps for the 1-, 2-, 5-, 10-, 50-, 100-, and 500-year floodplains using FEMA data and existing U.S. Geological Survey (USGS) topographic data.
- Preparing an interim digital terrain model (DTM) and contour map of the floodplain study area utilizing the Light Detection and Ranging (LiDAR) technique.

These mapping data will be provided to the MDEQ in ESRI™ format. It is our understanding that MDEQ can use data in this format. Select hard copy maps will also be provided showing representative sets of these features.

4. Description of IRA Area

The IRA Area is as described in Condition IX.B.2. of the License: the Tittabawassee River and Floodplain beginning at the upstream boundary of The Dow Chemical Company Midland Facility and the confluence of the Tittabawassee and Shiawassee Rivers that combine to form the Saginaw River.

5. Access Needs and Agreements

Mapping work that is part of this IRA can be completed without the need for access agreements. Most of the data have already been published in public sources and will simply be compiled for this project. New data that will be collected for this IRA include an interim DTM and contour map that will be generated from aerial flyovers tied into established ground control stations.

6. Scope of Work

The following sections describe the mapping tasks that will be completed as part of this IRA. Some of these tasks have already been completed and will be included in the mapping data provided to MDEQ as part of this IRA.

6.1 ESRI™ ArcMap™ GIS

Mapping of the Tittabawassee River and Floodplain will be compiled using GIS. The selected GIS software is ESRI™ ArcMap™, which is part of ArcView 8.3, a commonly available system and format used by numerous government agencies, states, and municipalities. The State of Michigan provides geographic information in ESRI™ ArcMap™ compatible files, and mapping completed as part of this IRA will also be compiled in this same format.

6.2 State of Michigan GIS Data

The State of Michigan, Department of Information Technology, Center for Geographic Information (MI CGI), Geographic Data Library provides geographic information on its web site http://www.mcgi.state.mi.us/mgdl/. Files obtained from the Michigan Geographic Data Library were used to form the base map for all the Tittabawassee River and Floodplain mapping activities. Mapping features that have been incorporated into the GIS for the site include the following:

- Transportation features, including primary and secondary roads, railroads, and airports
- Rivers, lakes, streams, and wetlands
- Aerial photographs from 1998
- Political boundaries, including cities, counties, congressional districts, school districts, and townships
- Topographic elevations (10 meter contours)
- Zip code areas
- Major pipelines and power transmission lines

These data were compiled from numerous data files. Other data are also available from the Michigan Geographic Data Library and can be added to the GIS at any time, if the information is pertinent.

6.3 Floodplain Maps

6.3.1 FEMA Maps

Flood Insurance Rate Maps (FIRMs) were obtained from the FEMA Flood Map web site (http://store.msc.fema.gov/) for Saginaw County and portions of Midland County (where available) along the Tittabawassee River. The maps were provided as pictures, or raster

files, and contained no georeferencing. The FIRMs show the estimated 100- and 500-year floodplains, along with roads, city boundaries, text, cross sections, base flood elevations (BFE), flood hazard areas, and shading. The FIRMs were georeferenced to the Michigan State Plane coordinate system using control points and road intersections. Vector data created by FEMA (FEMA quality level 3, or Q3) describing the estimated 100- and 500-year floodplains was obtained from the Michigan Geographic Data Library (http://www.mcgi.state.mi.us/mgdl/). The Q3 vectors were compared to the georeferenced FIRM for floodplain accuracy and completeness. Q3 floodplain vector data for Midland County was not available. FIRMs were not available for the area between the Midland City boundary and the Saginaw County line (approximately 1.5 miles).

Floodplain data obtained from FEMA were, in some reaches of the river, based on hydraulic analyses conducted in the early 1980s. The analyses were based on hydrologic conditions (e.g., stream flow) current for that time period. Additionally, the floodplain topography was often not adequately represented in the models used to simulate water surface profiles, leading to inaccuracies in floodplain delineation. FEMA does not identify which river may cause flooding in an area.

6.4 Soil Types

Soil types for the study area were obtained from SSURGO and STATSGO electronic files obtained from MI CGI and imported into the GIS. The soils types were delineated by the United States Department of Agriculture (USDA) and are described in the Soil Survey of Midland County, Michigan (USDA, 1979).

The USDA soils mapping is based on a variety of physical data, including slope, drainage patterns, and soil profiles. Information for the USDA mapping was also gathered by examining aerial photographs for soil boundaries. The USDA also analyzed for additional physical properties such as grain-size, Atterburg limits, permeability, and color.

6.5 Local Zoning

Local zoning information for the study area has been obtained from the following sources in hard copy format:

- City of Midland
- Midland Township (Midland County)
- Ingersoll Township (Midland County)
- City of Saginaw
- Tittabawassee Township (Saginaw County)
- Thomas Township (Saginaw County)
- Saginaw Charter Township (Saginaw County)
- James Township (Saginaw County)

The City of Midland zoning shape files were created by scanning the hard copy maps into electronic format and then georeferencing and importing the electronic versions to GIS. The remaining zoning information was “heads-up” digitized into GIS (e.g., the polygonal hard copy zoning map information was drawn over the property parcel and street shape files already existing in the GIS).

6.6 Property Boundaries

The locations and ownership information were obtained for parcels in the study area. Property boundaries were obtained in electronic format from Saginaw County and were georeferenced and imported directly into the GIS. The parcels from Saginaw County also contain information on property ownership.

Property parcel ownership was not available in Midland County or the City of Midland. These records have been obtained from the city and townships in hard copy format. Shape files were created by scanning the hardcopy maps into electronic format and then georeferencing and importing the electronic versions into GIS.

In all cases, the property boundaries in the GIS are considered to be approximate at the time the information was collected (fall of 2003). The accuracy of the property lines is sufficient for the objectives of this IRA. If the exact location of property boundaries must be determined, a legal description would need to be obtained and an appropriate base map prepared. These are not included as part of this IRA and will only be obtained on a case-by-case basis.

6.7 Historic Aerial Photographs and Topographic Maps

The availability of historic aerial photographs and topographic maps was investigated through review of The Dow Chemical Company archives and by contacting publicly accessible sources. These additional sources of information include Michigan State University (MSU) Aerial Archives, USGS, Digital Data Services (DDS), Midland and Saginaw County Planning Offices, USDA, Environmental Data Resources (EDR), and National Aerial. Each source had some information available, however, only The Dow Chemical Company, MSU, and DDS were further pursued because they had the most complete or readily accessible information. A summary of the information obtained from these sources is provided below:

- Available historic topographic quadrangle maps were obtained in digital format from DDS.
- Historic aerial photographs at varying scales and covering portions of The Dow Chemical Company Michigan Operations – Midland (Plant) and Tittabawassee River corridor were obtained in hard copy format from The Dow Chemical Company archives for years 1945, 1956, 1960, 1962, 1967, 1970, 1972, and 1979.
- Historic aerial photographs covering the majority of the Plant and Tittabawassee River corridor were obtained from MSU in digital format for 1937 (Saginaw County) and 1938 (Midland County).
- Historic aerial photographs at varying scales and covering portions of the Tittabawassee River corridor were obtained from MSU in hard copy format for (1) Midland County in years 1952, 1965, 1972, and 1982; and (2) Saginaw County in years 1941, 1950, 1963, 1970, and 1980.

Based on a review of these historic aerial photographs and topographic maps, it has been determined that most photographs and all the maps will be kept in The Dow Chemical Company archives for use, as necessary, to meet the objectives of the RI. Additional aerial photographs to fill select gaps in coverage or year may be further pursued if this additional effort becomes critical. For this IRA, the aerial photographs from MSU for 1937/38 have been digitized and loaded into the GIS. These photographs provide the baseline for the

earliest overhead aerial coverage of the study area. As the RI progresses, other photographs may also be digitized and loaded into the GIS on a case-by-case basis to address specific informational needs.

6.8 Soil and Sediment Sample Locations

The locations of soil and sediment samples collected by MDEQ for laboratory analysis in the study area will be added to the GIS. The locations will be obtained from MDEQ and other sources, and a quality assurance step will be completed to determine the accuracy and reliability of the locations provided.

Initial review of the data available from MDEQ has determined that there are numerous problems with verifying the locations of the soil and sediment samples collected as part of various investigations conducted by MDEQ. These problems include the following:

- Missing location data from some samples shown in previously published reports
- Sample labels shown on MDEQ maps that do not correlate with analytical data reports
- Sample locations shown for which there is no corresponding analytical data

Dow will continue to work with MDEQ to resolve these problems so the most complete map of verifiable sample locations can be prepared. The sample location maps prepared as part of this IRA will include documentation of the surveying methods (and their estimated accuracy) used to find MDEQ sample locations on the maps, along with any data qualifiers.

6.9 Interim Topographic Map

A contour map will be prepared for the study area in order to evaluate the accuracy of the existing elevation data. A DTM and contour map will be compiled from airborne LiDAR data within the 500-year floodplain along the Tittabawassee River from Midland to the Saginaw River. This interim map will not meet FEMA or National Map Accuracy standards without integration of additional ground survey and aerial mapping data. The interim DTM will be used to evaluate current conditions, generate hydraulic data for comparison with the existing FEMA flood plane delineation, and for planning the RI.

Ground surface elevation data will be collected using airborne (LiDAR) techniques, a scanning laser system that produces accurate ground data used to generate a DTM and contour mapping. This technology, now an approved part of the FEMA floodplain mapping process, has been in existence for 20 years, with commercial applications for contour mapping the last 5 years.

The basic components of a LiDAR system are a laser scanner, a Global Positioning System (GPS), and an Inertial Navigation System (INS). The laser scanner is mounted in an aircraft and emits infrared laser beams at a high frequency. A mirror rotates and causes the laser pulses to sweep back and forth. The scanner records the difference in time between the emission of the laser pulses and the reception of the reflected signal. The position and orientation of the aircraft is determined using kinematic GPS and an INS. A GPS unit is located in the aircraft, in addition to several GPS ground stations. After the flight, the laser vectors are combined with aircraft and ground GPS stations and three-dimensional X, Y, Z ground coordinates are computed for each laser signal.

The accuracy of the LiDAR data will be specified to be:

- Elevations on open ground vertically accurate to 0.5 foot at a 90 percent confidence interval

- Horizontally accurate to 1/3000 the flying height at the same 90 percent confidence interval

This level of accuracy will not be possible for areas of dense vegetation or sudden breaks in elevation. The accuracy of the LiDAR data will be confirmed from ground GPS survey data on flat open surfaces. A quality control check of the LiDAR data will also be made, with a visual inspection of the data compared to existing 1998 aerial photography. The raw LiDAR data set produces extremely large data sets that require additional thinning and processing. The processed LiDAR data will be combined with the current bathometric survey data, and a DTM will be produced. From this DTM, an interim 2-foot-interval contour map will be generated of the study area.

Under the RI (not as part of this IRA), the LiDAR data will be combined with ground survey data and aerial mapping from newly acquired photography to produce a map product that will fully comply with FEMA and national map accuracy standards in areas where such accuracy is required.

6.10 Preliminary Floodplain Maps

To better evaluate the frequency of flooding in the Tittabawassee River and Floodplain, Dow will prepare interim floodplain maps for the 1-, 2-, 5-, 10-, 50-, 100-, and 500-year floodplains, utilizing FEMA hydraulic data and an interim topographic map (USGS 7.5 Minute Digital Elevation Model, or DEM). It is necessary to prepare these maps for several reasons:

- FEMA maps do not delineate areas more frequently flooded than the 100-year floodplain
- More accurate modeling tools are now available for floodplain delineation than the tools used by FEMA
- There is a need for improved representation of floodplain topography in some areas
- New topographic mapping of the floodplain will also take into account recent changes to surface elevations (such as cut and fill areas), as FEMA maps were last updated in 1997

Although the accuracy of the floodplain delineation will be much better than that provided by FEMA, the accuracy will be limited by the precision of the interim topographic data for the area. Final floodplain maps will be prepared following completion of the LIDAR topographic survey. Additional refinement to the topographic map will be completed in 2004 when new aerial photographs are obtained and elevations are further refined.

6.11 Report

Dow will prepare a brief report documenting the preparation of the maps that are part of this IRA. Information in the report will include the following:

- Documentation of the source of all data used to generate maps that are included as part of the IRA
- Summary of data quality and identification of any data quality concerns
- Preparation of the following hard copy maps:
  - Topography
  - 1998 aerial photographs

- 1937/38 aerial photographs
- MDEQ soil and sediment sampling locations
- Floodplains along the Tittabawassee River
- Local zoning
- Property ownership in the study area

All mapping information noted as part of this IRA will be provided electronically on a compact disk as ESRI™ ArcMap™ files.

7. Schedule

The IRA schedule is as shown in the SOW Schedule in Attachment G of the Revised Scope of Work, Tittabawassee River Sediments and Floodplain.

8. Contacts

The following contacts are identified for this IRA:

8.1 Dow

Ben Baker – Senior Environmental Project Leader
The Dow Chemical Company
47 Building
Midland, Michigan 48667
Telephone: (989) 636-0787

8.2 CH2M HILL

Gary Dyke – Project Manager IRA
CH2M Hill
1111 Washington Street
Midland MI, 48640

Chris Greer – Mapping Coordinator
CH2M HILL
One Dayton Centre, One South Main Street
Dayton, Ohio 45402-1828
Telephone: (937) 228-4285

9. References

United States Department of Agriculture (USDA), Soil Conservation Service. 1979. Soil Survey of Midland County, Michigan.

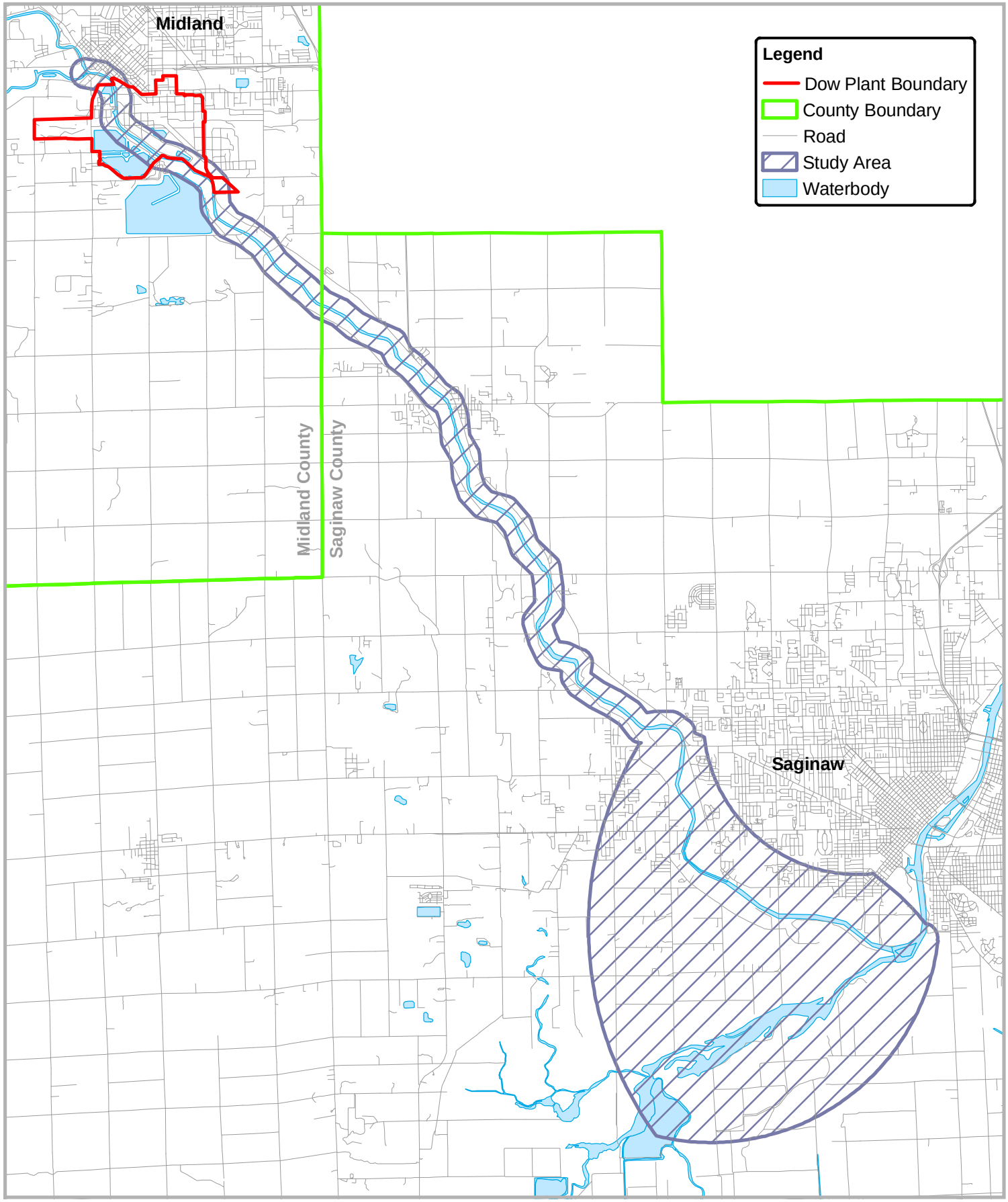

Figure B-1
Site Location
Tittabawassee River IRA
Dow Midland Offsite Corrective Action Program

Appendix C
Tittabawassee River and Floodplain IRA: Work Plan for Identification of Interim Action Properties

Tittabawassee River and Floodplain IRA: Work Plan for Identification of Interim Action Properties

Prepared for

The Dow Chemical Company

Midland, Michigan

February 2004

CH2MHILL

Contents

Acronyms and Abbreviations

Dow	The Dow Chemical Company
GIS	Geographic Information System
FEMA	Federal Emergency Management Agency
IRA	Interim Response Activity
MDEQ	Michigan Department of Environmental Quality
SOPs	Standard Operating Procedures

Tittabawassee River and Floodplain IRA: Work Plan for Identification of Interim Action Properties

1. Introduction

This work plan describes an Interim Response Activity (IRA) to identify residential areas located within the Federal Emergency Management Agency (FEMA) estimated 100-year floodplain of the Tittabawassee River between the City of Midland and the confluence of the Tittabawassee and Shiawassee Rivers (see Figure 1) that may frequently flood. This IRA will be conducted without evaluating whether the likely source of the potential for flooding is the Tittabawassee or Shiawassee Rivers. At the time this IRA will be conducted, inadequate information will exist to distinguish or predict which river will be the source of flooding near the confluence. This IRA is being performed pursuant to Condition XI.B.3.(a) of the Hazardous Waste Facility Operating License issued to The Dow Chemical Company (Dow) on June 12, 2003, by the Michigan Department of Environmental Quality (MDEQ). This work plan presents the following information:

- The objectives of the IRA
- A description of the approach to the IRA
- A description of the IRA area
- Identification of access needs and agreements
- Contacts

Standard Operating Procedures (SOPs) for implementation of the IRA are being developed and will be provided to MDEQ for review on or before April 1, 2004.

This area has been identified for an IRA based on the results of prior environmental sampling data collected by MDEQ. The area for evaluation includes property within the 100-year floodplain, as currently defined by FEMA, along the Tittabawassee River commencing at the upstream boundary of the Dow Midland Facility and continuing to the confluence with the Shiawassee River in Saginaw County. The location of the area is depicted in Figure 1.

2. IRA Objectives

The primary objectives of this IRA are to:

- Identify residential properties within the floodplain of the Tittabawassee River that touch the river, may be frequently flooded and, based on previous sampling by MDEQ, may have elevated concentrations of dioxins and furans in surface soils
- Develop a prioritized list of properties for further evaluation of potential exposure pathways or exposure controls.

3. Description of the IRA

The following process will be used to achieve the objectives stated above.

3.1 Mapping Confirmation and Offsite Survey

The purpose of this activity is to identify residential properties for conducting onsite observations. The onsite observations are to confirm that the properties are within the frequently flooded portion of the floodplain and are occupied and used as a primary residence, to confirm the address, and obtain information for prioritizing properties for further evaluation. For purposes of this IRA, "residential properties" are defined as properties containing an inhabited structure intended for use as a primary residence and a portion of the property must touch the river.

3.2 Onsite Observations

Visual observations of land uses and activities along the Tittabawassee River will be conducted using a list of locations identified in the previous activity. Observations will be conducted from publicly accessible areas and will identify the following within the line-of-sight:

- Proximity of residences to the riverbank, and topographic characteristics that may indicate an increased potential for flooding (e.g., flat slope between riverbank and residences and/or areas that may be used by residents)
- Conditions that would indicate potential for exposure to chemicals in soil in "frequently flooded" areas, such as presence of bare soil, planting areas, or gardens
- Evidence suggesting frequent use of "frequently flooded" portions of the property, such as the presence of lawns extending to the riverbank
- Evidence of activities within the "frequently flooded" areas that could potentially bring individuals into contact with potentially affected media (gardening, landscaping, construction, recreational areas, etc.)
- Confirmation of street addresses for residences within the frequently flooded areas (i.e. residences within the boundaries identified through the mapping survey)

Field observations will be conducted at a time when there is no snow cover on the ground.

3.3 Reporting

The following documents will be generated from this IRA:

- A map depicting the location of the residential properties that meet all of the following criteria:
  - Are at least partially within the "frequently flooded" portion of the floodplain and a portion of the property touches the river.
  - Contain evidence that there are activities within the "frequently flooded" portion of the property that may result in the potential for exposure, such as landscaping or bare soil around use areas.

- A list of addresses and owners (based on county and/or township records) with notations for each residence regarding proximity to the riverbank, presence/absence of bare soil or planted areas, presence/absence of gardens or livestock, presence/absence of other activities with potential for contact with soil.
- A prioritized list of the addresses for further evaluation. Residential properties that are contiguous to the Tittabawassee River, and with activities observed to be occurring within the frequently flooded portion of the properties, will be identified as higher priority for further evaluation under the RI.

The prioritized properties will be incorporated into the RI Work Plan in accordance with the prioritization process described in Section IV (Proposed RI Approach, Phasing and Prioritization of Work) of the RI Work Plan.

4. Area Addressed in This IRA

The area of investigation includes property within the 100-year floodplain, as currently estimated by FEMA, along the Tittabawassee River commencing at the upstream boundary of the Dow Midland Facility and continuing to the confluence with the Shiawassee River in Saginaw County.

5. Access Needs and Agreements

Access agreements will not be required for this IRA. The mapping activity will be conducted in-office and requires no field activities. The field observations will be made from locations within the public right-of-way.

6. Schedule

The IRA schedule is as shown in the SOW Schedule in Attachment G of the Revised Scope of Work, Tittabawassee River Sediments and Floodplain.

7. Contacts

7.1 Dow

Ben Baker – Senior Environmental Project Leader
The Dow Chemical Company
47 Building
Midland, Michigan 48667
Telephone: (989) 636-0787

7.2 CH2M HILL

Gary Dyke – Project Manager IRA
CH2M Hill
1111 Washington Street
Midland MI, 48640

Chris Greer – Mapping Coordinator
CH2M HILL
One Dayton Centre, One South Main Street
Dayton, Ohio 45402-1828
Telephone: (937) 228-4285

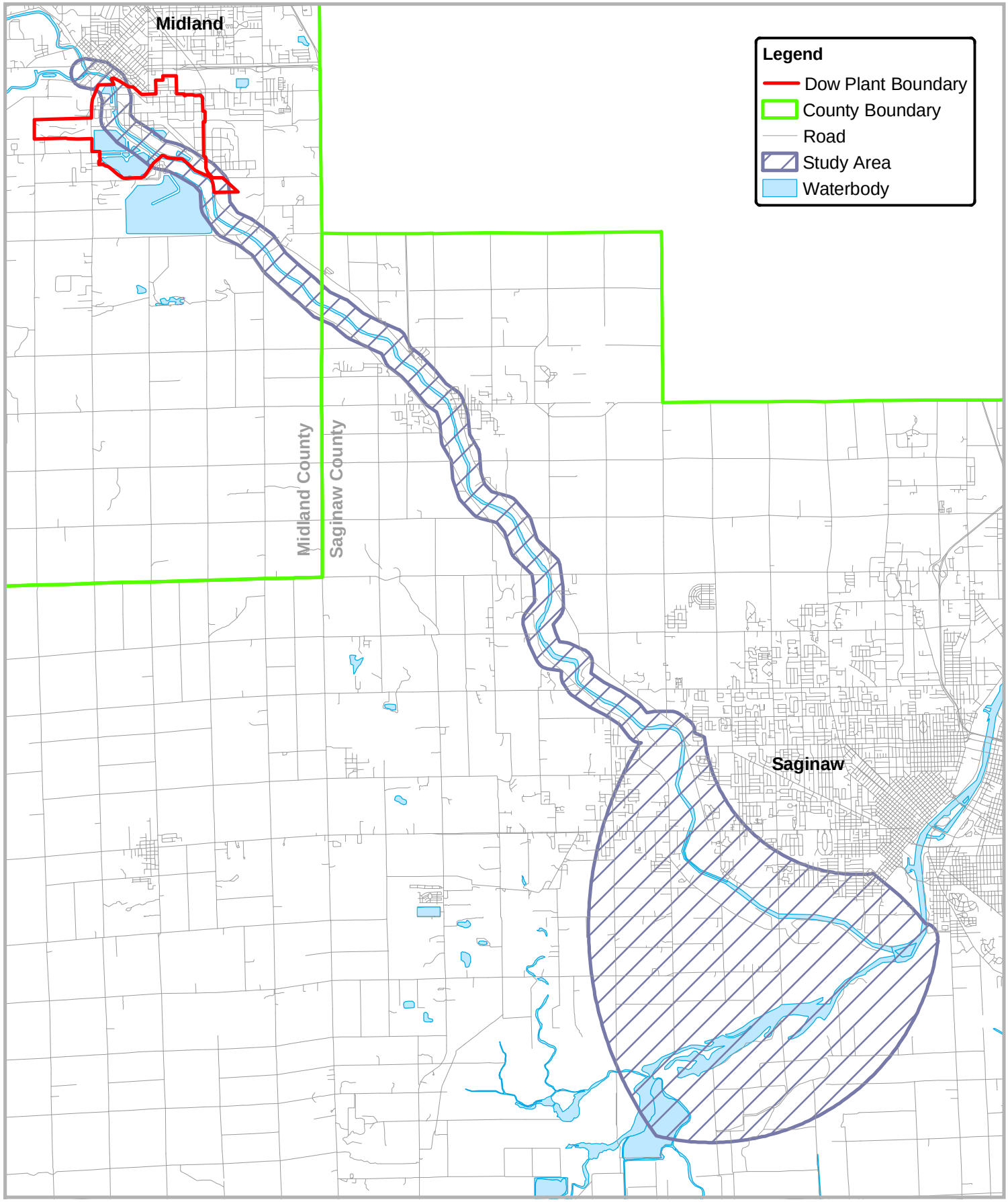

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Figure C-1
Site Location
Tittabawassee River IRA
Dow Midland Offsite Corrective Action Program

Appendix D
Tittabawassee River and Floodplain IRA: Work Plan for Property Owner Notification and Activity Survey

Tittabawassee River and Floodplain IRA: Work Plan for Property Owner Notification and Activity Survey

Prepared for

The Dow Chemical Company

Midland, Michigan

February 2004

CH2MHILL

Contents

Acronyms and Abbreviations

Dow	The Dow Chemical Company
IRA	Interim Response Activity
MDEQ	Michigan Department of Environmental Quality

Tittabawassee River and Floodplain IRA: Work Plan for Property Owner Notification and Activity Survey

1. Introduction

This work plan describes an Interim Response Activity (IRA) which will notify property owners and/or occupants of the IRA process, request their participation and obtain additional information regarding current land use and activities.

This IRA is being performed pursuant to Condition XI.B.3.(a) of the Hazardous Waste Facility Operating License issued to The Dow Chemical Company (Dow) on June 12, 2003, by the Michigan Department of Environmental Quality (MDEQ). This work plan presents the following information:

- Objectives of the IRA
- Description of the IRA
- Identification of access needs and agreements

The properties identified as "Interim Action Properties" will be included in this IRA.

2. IRA Objectives

The primary objectives of this IRA are to initiate contact with the owners of the Interim Action Properties, provide them with appropriate information, request their participation in the Interim Response Action process and obtain additional information about current land use and activity.

3. IRA Description

The first task of this IRA will be to send mailings to property owners and/or occupants. The mailing is expected to include:

- A cover letter containing a description of the overall IRA process, a summary of IRA results to date, and the purpose of the mailing.
- Copies of potentially appropriate and applicable educational materials currently available or developed as part of the Community Information IRA will be included in the mailing.
- An "Activity Survey" will request basic information about the people who use the property (such as age, frequency of use, etc.), how they use the property (gardening, recreation, outdoor eating, etc.), and the location of the various activities.

- A draft Access Agreement will be included requesting permission for Dow representatives to enter the property to observe site conditions and perform sampling.

In the cover letter, Dow will request that the property owner and/or occupants contact Dow to confirm receipt of the materials and indicate their willingness to participate in the IRA. To the extent Dow is able to obtain telephone numbers for individual property owners, Dow will attempt to follow the mailing with a telephone call. Dow will copy MDEQ on these initial mailings, so the Agency has a record of contact.

Additional IRA activities will be determined based on the owner/occupant's response to this Notification and Activity Survey. If the owner/occupant elects not to participate, Dow will have provided them with educational material and contact information, but will not be able to identify the need or offer specific interim actions. If the owner/occupant elects to participate:

- Dow will meet with the owner to review the response to the Activity Survey, walk the property to observe the condition and physical characteristics, and develop a good understanding of how the property is being used. This information will be combined with sampling data, as discussed below, to determine which Exposure Category is appropriate for the property. Each Exposure Category corresponds to a range of interim actions that will be discussed with the property owner, as described in Section 2.2.
- During this meeting, Dow will discuss what type of sampling may be appropriate for the property. Dow and the property owner will identify sample locations and finalize necessary access agreements.
- Dow will provide the owners with a letter that summarizes the meeting and will provide information on future activities (such as a general schedule for sampling and other information as requested).
- If the results of the Activity Survey and meeting indicate that the property does not meet any of the criteria associated with implementation of an interim action (as shown in Section 2.2), Dow will send the owner a letter indicating that no interim actions will be taken at this time.

4. Reporting

The following documents will be generated from this IRA:

- A map depicting the location of residential properties that have been evaluated under this IRA. Previous mapping will be updated with relevant additional information that may be obtained from the survey and/or discussions with the owners/occupants.
- A list of addresses and owners.
- A summary of the information obtained from the surveys and discussions with the owners/occupants.

5. Area Addressed in This IRA

Will be determined based on the results of the Identification of Interim Action Properties IRA.

6. Access Needs and Agreements

Access agreements will be required for all properties included in this IRA. As previously noted, Dow will be providing a access agreement to all property owners and occupants as part of the initial mailing.

7. Schedule

The estimated schedule for this IRA is shown in the SOW Schedule in Attachment G of the Revised Scope of Work, Tittabawassee River Sediments and Floodplain. The duration and completion dates for this IRA are dependent on the response times and schedules of the owners and/or occupants of the property. However, Dow will make every effort to complete this IRA within a 30 (calendar) day period.

8. Sample Survey and Access Agreement Forms

Example survey forms and sample access agreements are provided at the end of this IRA Work Plan. The form of the access agreement will depend upon the type of access needed and the work to be performed. The final form of the access agreement will depend upon negotiations between Dow and the property owner/resident.

Activity Survey - Page 1 of 2

Surveyor Information

Date: _____ Completed by: _____

Phone: _____ e-mail: _____

Residence Information

Name: _____ Phone number: _____

Address: _____ e-mail: _____

City: _____

County: _____

Survey Questions

1. What type of structure is at the residence? **Mobile home** **Single story** **Multiple story**

2. Total number of residents (adults and children): _____

3. Approximate ages of residents:

Between:	Number
0-6 years	
7-12 years	
13-18 years	
19-35 years	
36-55 years	
56-75 years	
>75 years	

5. Are there outdoor play or recreational areas at this residence? **yes** **no**

6. Is there a basement at the residence? **yes** **no**

7. Do any household members engage in gardening? **yes** **no**

8. Do household members perform landscaping at the residence? **yes** **no**

9. Do any household members raised livestock at the residence? **yes** **no**

10. Are construction, renovation or landscaping projects planned in the near future at the residence? **yes** **no**

Please use the back of this form for any comments

Residence Information Form - Page 2 of 2

Date: _____

Residence Information

Name: _____

Address: _____

COMMENTS

Sample Access Agreement Language

Sample #1

AGREEMENT FOR ENVIRONMENTAL SAMPLING ACCESS

Site Address: _____

_____

_____

_____

As owner of the above-referenced property, _____ hereby grants (consultant), its contractor(s), agents, employees the right to enter the referenced property on behalf of The Dow Chemical Company (Dow), for the purpose of performing environmental sampling activities at the approximate location(s) identified on the attached diagram. (Consultant) or its contractor(s) shall consult and reach an agreement with the property owner prior to completing the sampling activities at the identified locations or at alternate or additional locations.

Soil borings will be completed and abandoned in accordance with applicable State of Michigan legal requirements.

Analytical results from the laboratory analysis of the sampling shall be provided to the property owner at the same time as the results are provided to the MDEQ.

By: _____ _____
Date

Title: _____

Property Owner

By: _____ _____
Date

Title: _____

Sample #2

Property Owner

Re: Site Access Agreement
(Address of Property Subject to Agreement)

Dear Property Owner:

We represent The Dow Chemical Company (Dow) in matters related to its investigation of the (study area). We understand that you own property at (address), which is (adjacent to/within study area). Dow has asked us to write to you concerning its work at the property, and to request your permission for access to your property to (description of work – e.g., collect x soil samples at the approximate locations shown on the attached map). This agreement is intended to supersede any prior access agreement between you and Dow, or its consultant, concerning your property.

Dow will provide you with the analytical results provided to the State of Michigan from sampling at your property. Reasonable measures will be taken to avoid damage to the property and/or interference with the present use of the property. [Dow will indemnify and hold you harmless from and against any loss, costs, damage or expense arising out of Dow's work on the property, except to the extent that you, or conditions existing at your property, may be at fault.] Upon completion of work with respect to the (study area), Dow will remove all equipment and restore the property to its condition prior to commencement to the work.

If you agree to grant Dow's request for access, please sign at the space provided at the end of this letter and return this letter to me. Your signature at the end of this letter will serve to grant Dow (including its employees, agents and consultants), permission to enter onto your property and perform the work described above. You may revoke this permission at any time by giving Dow at least sixty (60) days written notice of your intent to revoke.

If you have any questions about the terms of this letter, or would like further information about Dow's work, please do not hesitate to call me at the above letterhead address or at [ ].

Very truly yours,

Dow Representative

I have read the preceding letter and hereby grant Dow permission to enter onto my property under the terms described above.

Dated: _____ _____
(Name of Property Owner)

Sample #3

ACCESS AGREEMENT

This Access Agreement is made and entered into this _____ day of _____, ____ by and between (property owner) ("Grantor") and (The Dow Chemical Company) ("Grantee") pertaining to property located at _____ (the "Subject Property"), as follows:

A. Grantor is the current owner of the Subject Property. Grantee wishes to conduct environmental studies (the "Work") on the Subject Property.

B. Grantor wishes to provide to Grantee temporary ingress and egress on and over the Subject property for the limited purposes of conducting the environmental studies.

NOW, THEREFORE, in consideration of the foregoing and other good and valuable consideration, Grantor for itself, and its successors and assigns agrees with Grantee as follows:

Subject to the conditions and limitations listed below, Grantor hereby grant to Grantee, and Grantee's agents, environmental consultants, employees, contractors and sub-contractors, the right to enter onto the Subject Property for the purposes of completing the Work:

1. Grantee shall assume full responsibility for the proper abandonment of the Work and its components, in accordance with any applicable federal, state and local

laws, rules, regulations and ordinances, wand shall remove all equipment used in the Work as soon as possible after the Work is completed.

2. Analytical results from laboratory sampling from the Work on the Subject Property shall be provided to Grantor when the results are reported to the Michigan Department of Environmental Quality.

3. Grantee will provide Grantor with copies of all reports prepared regarding the Work, upon request.

4. Grantee, and its agents, consultants, employees and contractors, agree to comply with all applicable laws, regulations, rules and permits, including, but not limited to environmental, OSHA and other health and safety matters, while performing the Work on the Subject Property.

5. Grantee shall indemnify, defend and hold harmless Grantor from and against any and all suits, claims, actions, administrative proceedings, damages, losses, costs (including costs of defense, settlement and reasonable attorneys fees), which are based upon or arise out of the acts or omissions of Grantee or its' agents, employees, consultants and contractors in performing the Work.

6. Upon completion of the Work, Grantee agrees to restore the Subject Property to the same condition or better than it was prior to engaging in the Work, repairing or replacing any and all damages to the property within thirty (30) days of the date upon which Grantee has ceased Work upon the Subject Property.

7. This Agreement may be terminated by Grantor for Grantee's failure to comply with the terms and conditions contained in this Agreement upon written notification to Grantee. Otherwise, this Access Agreement, except the indemnification provisions of Paragraph 5, shall terminate upon completion of the Work being conducted by Grantee, the removal of all equipment used in the Work pursuant to Paragraph 1, the provision of analytical results and reports pursuant to Paragraphs 2 and 3, and the restoration of the Subject Property pursuant to Paragraph 6 of this Agreement.

IN WITNESS HEREOF, this Agreement has been executed the day and year first above written.

by Grantor:

_____

By Grantees:

_____

Sample # 4

CONSENT FOR ACCESS TO PROPERTY

Owner:

Description of Property:

The undersigned, _____, hereby consents to officers, employees and authorized representatives of The Dow Chemical Company, entering and having continued access to the above-referenced property for a period of thirty-six (36) months, beginning on the date hereof, for the following purposes:

(i) inspecting, sketching and photographing the premises;

(ii) collecting surface and subsurface soil samples;

(iii) collecting sediment samples;

(iv) conducting other environmental or ecological monitoring;

(v) transportation of equipment onto and about the Site as necessary to accomplish the activities above, including trucks and sampling equipment;

(vii) the placement of [e.g. animal traps, clay pads] on the Site as necessary; and

(viii) any other actions required pursuant to the (license issued to Dow by MDEQ (the "License")).

Dow representatives granted access for the above-listed purposes shall use reasonable efforts to minimize interference with, or interruption of, Owner's use of the premises. To the greatest extent achievable, said access to Owner's premises will be limited to ordinary business hours of 8:00 a.m. to 5:00 p.m. Monday through Friday.

Dow representatives granted access for the above-listed purposes shall sign-in on their arrival at the Owner's facility, noting, name, date, time, organization, and the purpose of the access or visit. Owner shall maintain a sign-in log for this purpose.

Owner expressly disclaims liability to all Dow representatives for any and all personal injury or property damage occurring on or about the Owner's premises not caused by Owner's negligence or willful misconduct.

We realize that these actions are undertaken by Dow pursuant to (the License).

This written permission is given by the undersigned voluntarily with knowledge of the undersigned's right to refuse and without threats or promises of any kind. The undersigned does not admit any liability with respect to the property by the undersigned's act of granting access to Dow.

This ____ day of _____, ____.

By: _____ Witness: _____

Its: _____